



© UNHCR



Guide to

Guide to Four Wheel Driving

How to use

the vehicle effectively,

for safe driving.

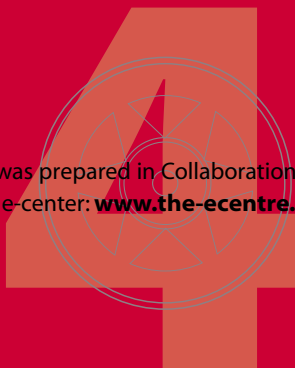


Four Wheel Driving

TOYOTA MOTOR CORPORATION



This Guide was prepared in Collaboration with the UNHCR e-center: www.the-ecentre.net



TOYOTA MOTOR CORPORATION

Copyright 2001 Toyota Motor Corporation. All rights reserved.

INTRODUCTION

HOW TO

use the vehicle effectively, for safe driving.

In this manual you will find basic information needed to operate a 4WD. Even if you are an experienced 4WD user, you will probably find some information in here you didn't know or be reminded of something you may have forgotten. In any event, please enjoy reading through this manual and learning or re-learning the benefits of owning a Toyota 4WD.

CONTENTS



① Basic Information for 4WD

- 4 How 4WD Works
- 5 Using 4WD Vehicles
- 8 Basic of Off-road Driving

② Driving Techniques

- 11 Hill-climbing
- 13 Down-hill Driving
- 14 Ditch
- 16 Slope
- 17 Muddy Soil
- 18 River
- 19 Sandy Soil
- 20 Rocky Surface
- 21 Snowy Surface

③ Remarks

- 26 Escape
- 28 Winching Techniques
- 30 Inspection before Driving
- 32 Inspection after Driving

Basic Information

for 4WD

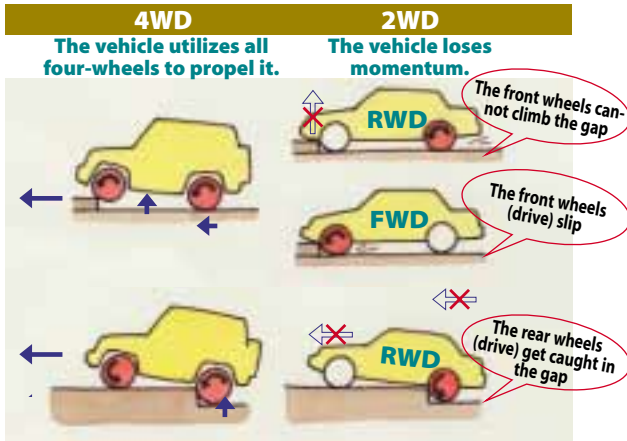
How 4WD Works

The mechanism and characteristics of four-wheel drive (4WD) vehicles

Most cars on the road today move by using two wheels, either on the rear (RWD) or on the front (FWD) of the vehicle. 4WD, on the other hand, uses all four wheels. By mobilizing all four wheels, it can

move the vehicle even if one of the wheels doesn't have traction. 4WD gets more traction than RWD or FWD and ensures stable driving off-road—on sandy, muddy or slippery surfaces.

The Difference between 4WD and 2WD



Using 4WD Vehicles

Using 4WD vehicles

2WD



- 1 **FWD:** Front Wheel Drive
- 2 **RWD:** Rear Wheel Drive

4WD



- 1 **Full Time 4WD:** Permanent 4WD
- 2 **Standby 4WD:** Usually 2WD, becomes 4WD automatically when it is necessary.
- 3 **Part-time 4WD:** Usually 2WD, becomes 4WD by the driver's choice.



© UNICHR

4WD mode

With full-time 4WD, no action is necessary. With part-time 4WD, drivers must lock the front free-wheel hubs and shift into four wheel drive.

Sub-transmission

There are two types of 4WD regarding transfer.

- 1 Transfer lever type:** Shift the lever to "H4" or "L4".
- 2 Switch type:** Push a switching button.



As a general rule, shifting into 4WD is to be done while the car is parked. Yet, there are types of 4WD that allow the shifting to be done while the vehicle is in motion. Confirm the appropriate procedure (by consulting the operation manual) so as not to damage the vehicle and to avoid accidents. When the shift is made, usually an indicator lamp lights up to confirm the shift. However, the lamp can fail and driving the car is a better way of confirming that the shift into 4WD has taken place.

Locking the front free-wheel hub

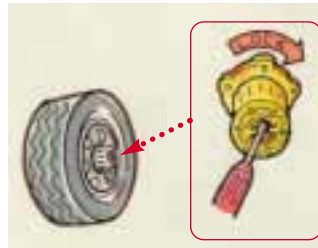
Shifting the gearbox to 4WD mode is only half of the procedure to actually engage all of the wheels. The front drive shaft has to be connected to the front wheels, too. There are three types of connections here.

- 1 Manual:** Rotate the dial of the front free-wheel hub into "lock" position.
- 2 Power Locking:** Push the hub-lock switch button. Some 4WD vehicles with power-locking connections require the vehicle to be

in reverse motion to do this. So it is not possible to do this if the car is stuck. These vehicles require the driver to lock the front free-wheel hub in advance.

- 3 Automatic:** The locking of front free-wheel hub is done while the driver shifts into 4WD mode.

Manual



Power Locking



Hub Lock & H4 button

Basic of Off-road Driving

| DRIVING POSITION | DRIVING CONDITIONS |
|-------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2WD H2: Lever at "H2" (High speed position, two wheel drive) | Use this for normal driving on dry, hard-surfaced roads. This position provides better economy, a quieter ride and the least wear. |
| 4WD H4: Lever at "H4" (High speed position, four wheel drive) | Use this for normal driving on wet, icy or snow-covered roads. This position provides greater traction than two-wheel drive. |
| 4WD L4 (Low speed position, four wheel drive) | Use this for maximum power and traction. Use "L4" for climbing or descending steep hills, off-road driving, and hard pulling in sand, mud or deep snow. |

Driving slowly when using L4.



LSD & Differential lock system

LSD (Limited Slip Differential)

Some vehicles are equipped with a limited-slip differential. If one rear wheel begins to spin, the limited slip differential automatically transfers the drive to the other rear wheel.

Differential lock system

Some vehicles are equipped with a front or rear differential lock system.

1. This differential lock system is effective in case one or either right or left pair of the wheels is spinning. Before using the front and rear differential lock system, first shift the four-wheel drive control into "H4"

or "L4" with the free-wheel hubs engaged to see if it works. If this has no effect, also use the front and rear differential lock system.

2. Do not use the front and rear differential lock in conditions other than the above as it will make steering and cornering very difficult. This is especially true when using the front differential lock in addition to the rear and may cause the vehicle to spin suddenly during acceleration or engine braking.*

**Engine Brake: By backing off the accelerator, you can use the engine to help you brake. The resistance, of the slowing engine, slows the wheel speed and effectively slows the vehicle.*

Tight corner braking phenomenon

When driving in 4WD, making a sharp turn can feel like the vehicle is blocked. This is called tight corner braking phenomenon and is a result of the difference in the rotation speed required for the front

and rear wheels. While this is not a malfunction, driving on a road with good traction could result in worn tires and damage the mechanism. It should be avoided. Driving without the center differential locked helps avoid this problem.

Driving Techniques

| SITUATION | CHECK POINTS TO JUDGE THE DRIVEABILITY | GEAR SELECTION |
|----------------------|--------------------------------------------------------------------------------------------------|------------------------------------------------------------|
| Hill Climb | Angle, Length, Surface (hardness, solidity, gap, slipperiness) Drop or curve at the top of slope | Gear which requires no shift change |
| Down Hill | Angle, Length, Surface (hardness, solidity, gap, slipperiness) | Use a lower gear to get the maximum engine brake |
| Ditch | Width, Depth of ditch, Angle, Surface (sand, stone, mud, solidity) | |
| Slope | Angle, Width, Distance, Surface (hardness, solidity, gap, slipperiness) | |
| Muddy Soil | Angle, Width, Distance, Surface (solidity, existence of track or gap) | Use a lower gear |
| River | Depth, Width, Distance, Speed of the flow, Bottom (Stability, solidity, gap slipperiness) | L4 |
| Sandy Soil | Gradient, Distance Surface (solidity, gap) | L4 |
| Rocky Surface | Gradient, Distance Surface (solidity, gap, slipperiness) | L4 |
| Snowy Surface | Gradient, Distance Surface (iced, gap, hidden object under snow) | Use a higher gear when starting and a lower gear down hill |

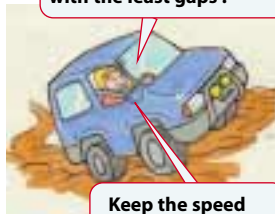
Hill-climbing

Approach run

If the slope is steep or has a slippery surface, making an approach run could reduce slip while climbing. If there is no room for an approach

run, an alternate route should be used. However, an approach run should be restrained to gapless surfaces. When there is a gap on the surface it is better to climb slowly and steadily to reduce the shock to the under body.

Choose in advance the route with the least gaps .



Keep the speed steady...



The vehicle can end up making a big leap otherwise.

Tips for driving

1 Speed, distance and direction: Make an approach run at an adequate speed and from sufficient distance. Climb the hill straight towards the top.

2 Long climb: When climbing a long hill, keep the speed steady.

3 Clutch operation: It is best not to shift. However, if a change is required on the way, do it quickly and with little clutch use to avoid losing momentum and traction.

2 Driving Techniques

4 Acceleration: Use a steady acceleration up the hill and back off the acceleration towards the top to avoid shooting over the top.

If the wheels lose traction because the surface is slippery, slightly decelerate to bring the traction back.

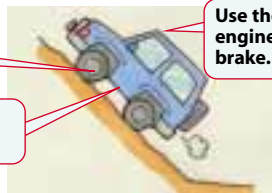
Recovery

If you slip before reaching the top, back up using the engine as a brake. This is your recovery. Keep the steering wheel pointed toward the top of the slope and use the

rear-view mirror to guide your descent. It is best not to use the foot brake to avoid tire-lock. However, brake gently to keep the vehicle under control* in cars with automatic transmissions due to the lack of enough engine braking.

Make a careful recovery when an attempt fails.

Back up straight and avoid locking tires.



Use the engine to brake.

Vehicles with ABS allow the application of even full-braking though full-braking may require a longer distance to come to a full stop.*

***ABS: The ABS (Anti-lock Braking System) prevents wheel lock-up allowing the driver to take evasive action while braking.*

Down-hill Driving

Tips for driving

1 Gear selection and braking:

Choose a low gear to take advantage of engine braking and to be able to avoid using the brake. On a steep or slippery slope, choosing "L4" to get the maximum engine brake is appropriate. Of course the conditions and type of vehicle (manual or automatic, etc.) may necessitate foot braking.

2 Maintain the direction:

Down-hill driving should aim

straight down the hill. If the tires lose traction, slightly accelerating can help regain traction and steering control.

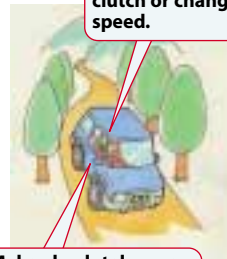
3 Long slope: Vehicles tend to gain momentum as they go downhill. Regardless, try to maintain a steady speed.

4 Clutch operation: When driving down-hill, don't clutch, as it will nullify the engine brake. This causes loss of traction and accelerates the vehicle. It is one of the most dangerous things when driving downhill.

Before driving a down-hill, check the surface condition and choose a gear that is adequate to the gradient.



Avoid operation of the clutch or changing speed.



Make absolutely sure to keep the vehicle speed constant.

2 Driving Techniques

Driving over a Ditch

Tips for driving

1 Approach angle and drive path: Approach ditches/holes at an angle for maximum control. Direct approaches could result in hitting the bumper or underguard against edge of the ditch. The angled approach increases clearance. The angled approach also forces tires into the ditch one by one, reducing the impact to the

body. It is important at this time that at least three of the tires maintain traction. Be sure to use full-time 4WD with center differential activated when driving in these conditions.

Caution: If your angle is wrong, two tires may enter the ditch at the same time, which could cause you to get stuck. Drive carefully.

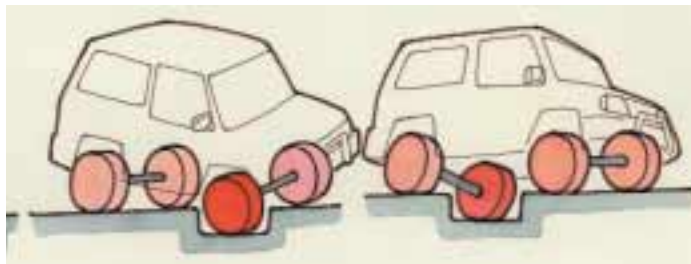
Approach a ditch slantwise and drop the tires one by one.



2 Driving speed and acceleration: Slowly enter one tire at a time into the ditch/gap. Then, accelerate a little until the tire starts to pass the lip and decelerate right after the tire clears the ditch. Repeat this process for all four tires. On a slippery surface, increase or decrease speed as needed.

3 Mitigate depth or slope: When the depth or the angle is too great, adjustments could be made by placing a rock or other object where the tires hit.

Apply the tire to the "wall" of a ditch/gap and then accelerate gently to bring the tire over the "wall". Decelerate right after the tire goes beyond the "wall."



2 Driving Techniques

Driving over a Slope

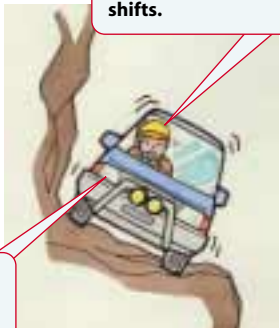
Tips for driving

1 Approach angle:

Use different approaches should be applied depending on the circumstance. Given a choice, however, keep the driver's seat closer to the mountain side gives the driver an increased sense of security.

The driver's seat should be mountain side to help prevent panic and feelings of vertigo.

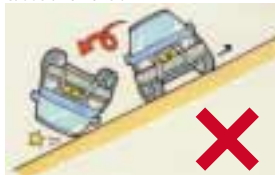
Avoid frequent gear shifts.



2 Driving speed and acceleration:

Steady acceleration or a constant speed is best.

Steering to the mountain side could cause a roll over.



Steer to the valley side to adjust the direction of the vehicle.



Driving through Muddy Soil

Tips for driving

1 Driving path:

Only drive through shallow mud (the depth should not go above the center of the differential); remain on as solid a surface as possible.

2 Gear selection:

Choose the gear one lower than the one capable for managing the surface. If the vehicle is equipped with a differential lock system, activate it.

3 Clutch operation: Maintain a speed in which traction is not lost and do not change gears. Shifting can result in sudden deceleration and make the vehicle stick in place.

4 Steering operation:

Rotating the steering on muddy surface causes increased resistance. Keep the direction constant.

5 Adjustment of tire pressure:

On a muddy surface, mud can stick in the tire tread which reduces traction and the vehicle can easily get stuck. To prevent this, reduce tire pressure to the level of 1.2 kg/cm² to 1.5 kg/cm². This increases traction. If the mud is very wet, increasing the tire pressure could increase the traction by making mud less likely to stick on the tires.

Utilizing tire chains

On a muddy surface, consider using tire chains.

2 Driving Techniques

Driving through a River

Tips for driving

1 Approach angle and driving path: Choose a downstream path. Going against the flow could stop the vehicle. Also avoid anywhere deeper than the center of the tires. In shallow places where the stream is slow, you must be careful of mud and sand accumulations. Water is deeper than it appears, so add 20 to 30% to the depth as it looks from the surface.

2 Gear selection and speed: "L4" is a good choice and constant acceleration prevents water from entering the muffler and the engine. Water entering the air intake or electrical system would cause water-hammer* or a short-circuit.

3 Steering operation: The bottom may not be visible because of mud or sunlight reflected on the river surface. Such situations could



Avoid shifting to get up and down.

result in the vehicle getting caught in a gap at the bottom. To guard against such an incident, your thumbs should not be placed inside the steering wheel.

4 Selection of landing area: The landing area should be a point with a solid surface and a small vertical gap. (Many vehicles get stuck at the landing point.)

**Water-hammer: If a quantity of water coming into the combustion chamber exceeds its capacity, proper compression stops. This may cause a connecting rod to bend or even break and may also damage a piston.*

Driving through Sandy Soil

Tips for driving

1 Traction and tire pressure: In sandy soil, the sand is soft and the resistance is high. Similar to muddy soil, gaining traction in sand is difficult. In order to avoid getting stuck, reduce the tire pressure. However, too much reduction could cause the tires to separate from the rims causing a whole new set of problems.

2 Gear selection: Considering the strong resistance, "L4" is a good choice. If the vehicle is equipped with a differential lock system, activate it.

3 Steering and clutch operation: Don't turn suddenly. Stepping on the clutch could get the vehicle stuck. Therefore, use a gear which will take you through the entire trip without shifting. If you must shift, do it quickly so as not to lose momentum. Automatic transmis-

When the vehicle is stuck, lower the tire pressure to make the restart easier but don't forget to add pressure afterward.



If the vehicle stops, turn the steering straight before restarting.

sion is thus preferable over manual transmission as it doesn't require the driver to use a clutch.

4 Stopping a vehicle: Applying brakes will sink the vehicle. Therefore, let the vehicle stop by itself or, even better, stop the vehicle on a solid surface or at a high position so that restarting on a downhill slope is possible.

2 Driving Techniques

Driving on a Rocky Surface

Tips for driving

1 Gear selection and speed: “L4” would be the right choice to drive through steep and rocky surfaces.

Drive at a walking speed. Fast driving kicks up stones which can damage the vehicle, while impact from driving over a gap could damage the wheels or suspension.

2 Driving path: It is best to have an assistant guide the driver for safety. Look for sharp rocks which can damage the wheel or burst a tire. When driving over rocks, make sure they can't move. If a rock tilts when initially touched, it could lodge under the body of the vehicle or could give way causing a roll-over.

3 Tire pressure: Lowering the pressure is an option when better

traction is required. However, higher pressure is required most of the time in order to minimize the possible damage by the rocks to the tire and wheel.

4 Steering operation: In preparation against the kickback from the rocky surface, place your thumbs on the steering wheel. A firm grip is necessary to avoid straying from the chosen path.



Ask an assistant to guide the driver.

Driving at high speeds is always dangerous.



Driving on a Snowy Surface

Tips for driving

INSPECTION OF THE SURFACE

1 As dangerous objects could be underneath the snow, walk on the surface to test it before driving through snow.

2 The maximum depth of snow you should drive through is up to the differential. If the surface consists mostly of new, dry snow, the maximum height could be up to the bumper. Anything deeper requires the vehicle to repeat the process of pushing the snow and then backing up.

3 The quality of the snow would change its resistance. Vehicles can get more easily stuck in wet and icy snow.

4 Some vehicles get more stability by driving through a track left by previous vehicles.

STARTING THE VEHICLE

Abrupt clutching results in loss of

traction. To start a vehicle, engage the clutch gently and gradually. Select a higher gear, too. With an automatic transmission vehicle, simply release the brake pedal to start the vehicle in motion.

DRIVING SPEED

On a road with an icy or snowy surface, drive at less than half the regular speed.

STEERING OPERATION

1 Use studless tires* when driving through snow. Over confidence of driving a 4WD could lead to the vehicle getting stuck or to an accident. Once the vehicle loses trac-

**Studless Tires: The specific tire for driving on an icy or snowy road. The main benefit of this tire is its ability to keep elastic in cold temperatures, which in turn improves its traction. The tread of this type of tire is specifically designed for smooth driving on icy or snowy roads.*

2 Driving Techniques

tion, there is no difference between 4WD and 2WD.

2 Making a sharp turn is dangerous. If the vehicle starts to spin, it tends to spin towards the lower side of the road or towards the direction of the tire that slipped. Slowly, step on the accelerator pedal (don't release the pedal) and counter-steer to regain control.

3 When the vehicle starts to lose traction during cornering, drivers tend to overcompensate. The driver should be aware of this tendency, as sometimes the vehicle regains traction suddenly and starts a sharp turn.

BRAKE

1 Test the braking for tire lock-up in a safe environment. Knowing this limit helps the driver make delicate maneuver under pressure situations.

2 Even vehicles with studless tires or those using tire chains have lower grip against horizontal mo-

mentum. Therefore, the vehicle speed should be lowered before cornering.

3 The areas before intersections and corners tend to have slippery surfaces, as many vehicles have applied brakes at those points before.

UP-HILL SLOPE

Start the climb by observing the vehicles ahead and try not to stop while climbing. If you are forced to stop and can not restart, back up to the bottom of the slope and restart there.

DOWN-HILL SLOPE

Shifting or sudden deceleration while going downhill should be avoided as the vehicle could lose traction. Choose a low gear and let the engine control the speed.



Tire chains

1 Tire chains: There are metal chains and non-metal chains. Non-metal chains are lighter, easier to carry and attach. Conversely, metal chains are heavier and more difficult to attach. Yet, they are cheaper and easier to repair if broken and thus more suitable for cross-country driving.

2 Attaching chains: Chains should be attached as soon as the snow starts falling continuously. If oncoming vehicles are wearing them, attach chains. In the case of 4WD, attach chains to the tires with the heavier load. On deep snow or for driving downhill, use the front tires. In pressed snows and up-hill, use the rear tires. Generally speaking, attaching to the front tires risks damage to the inside of wheel-housing, axle or brake hose. Regarding vehicle control, attaching chains to the rear tires can increase under-steering,



but makes correction easier. If the vehicle gets stuck, the chains can be removed and reattached to the front tires for traction. Where chains should be attached (front or rear tires) is a case-by-case decision, but generally it is recommended to use the rear tires.

Other tips for cold places

SNOW ACCUMULATION ON THE VEHICLE

While driving, snow that sticks to the fenders could interfere with steering and snow on the head-lamps could affect the beam. Check these potential problems by inspecting it from time to time.

2 Driving Techniques

TRY NOT TO BRING SNOW INTO THE VEHICLE

Be careful not to bring the snow inside the vehicle on shoes and clothes as it could make the pedal surface slippery or freeze the pedals when the vehicle is parked.

PARKING

- 1 Avoid parking in a windy or snowy place or where a large block of snow could fall.
- 2 When parking for an extended period of time, have space to brush the snow before driving again.
- 3 One way to maintain battery power is by disconnecting the



cable. In an extremely cold place, removing the entire battery to be kept in a warmer place is another effective option. Changing the direction of the vehicle when parking or putting a corrugated paper or towels in or on the hood doesn't help very much.

4 So as not to let the parking brake freeze, park the vehicle without activating the parking brake. Leave the vehicle in either first gear or in reverse.

5 To prevent the wipers from freezing in place, move them to the up position, not touching the windshield.

6 To prevent keyhole freeze, insert an anti-corrosion lubricant into the keyhole.



FREEZING OF THE DOOR

If you force the door to open after it becomes frozen, you might damage its rubber seal. Apply heat with moderately warm water and wait for the door to defrost.

SELECTION OF FUEL

Gas oil freezes under minus 10 degrees and can choke the fuel line. Leave some room in the fuel tank before arriving at your destination so that refueling locally with non-freezing fuel is possible.

BATTERY LIQUID

When there is not enough fluid in the battery, the power supply goes down and restarting under cold conditions becomes difficult.

RADIATOR LIQUID'S QUANTITY AND CONCENTRATION

Prevent freezing by adding LLC anti-freezing radiator fluid.

WINDOW-WASHER FLUID

Driving through snowy conditions consumes a larger amount of window-washer liquid than normal. Make sure you have plenty.

STARTING THE VEHICLE

When a vehicle has been parked for a long time, the radiator fluid could be frozen slightly, even if anti-freeze is being used. If driving begins before the liquid melts, the little liquid left in the radiator could boil and burst the hose. Let the engine warm up before moving the vehicle. Wait until hot air comes out from the heater or until the water temperature gage starts showing some warmth.



Remarks

Escape from a Turned-over Vehicle

The reasons vehicles are turned on their sides

An abrupt turn during high speed driving, sudden braking, a collision

Maximum angle before turning on its side

In addition to keeping appropriate speed and avoiding abrupt operation, stay away from a roadside that might collapse; pay extra attention while driving steep slopes. The maximum tilt for a vehicle before it turns over when it is not in motion is somewhere between 30 degrees to left/right and 40 degrees to front/rear. When the vehicle is in motion, speed and

Escaping from an upset vehicle

If the vehicle flips, do not panic and behave with caution.

from the side, inadequate operation while driving a sloping road, shock from a road gap or road collapse can all cause a vehicle to flip.

road condition add to the instability. On rocky places with gaps, even a 5-degree tilt can cause the vehicle to flip. It is desirable to “feel” these angles in a safe and stable environment so as not to go beyond these limits in the actual driving situations. Vehicles modified to increase height or with other additions change its center of gravity and extra caution is required.

1 Turn off the engine: By turning off the engine, you prevent oil or fuel from catching fire or other engine trouble such as an engine

burnout. If the vehicle is equipped with an idling timer, turn it off as well.

2 Prepare for escape: Prepare to extract yourself from the seat belt and to be able to protect yourself if you fall.

3 Get rid of seat belt: If you cannot get rid of the belt, cut it with a seatbelt cutter.

4 Open the door or window: Open the appropriate door/window for you to make the escape. If the door/window is forced shut because of deformation of the body, use a hammer to smash the window and escape.

5 Escape from the vehicle: Examine to determine if the route of escape is a safe one and get out from the vehicle. Avoid getting close to the tires because an engine or transmission tends to be hot and the fuel tank could ignite. Assess the surface condition and stability of the vehicle before deciding which side of the vehicle from which to escape.

6 Escape to a safe place: To avoid secondary damage, get away from the vehicle and call for help.

Escape to the safe side!



3 Remarks

Escape tools that save life

Result could be fatal if the seat belt cannot be removed or if the windows or doors don't open quickly. To prepare for such an emergency, there are several escape tools. Most of them are a combination of hammer to break the windows and a scissors/cutter to cut the seat belt. They are useful to escape



from one's own vehicle and to save other people from their vehicle as well. Tool choices should be made carefully because functions differ with types and sizes. The tools should be fixed on a place within the reach of the driver even when the vehicle is turned upside down.

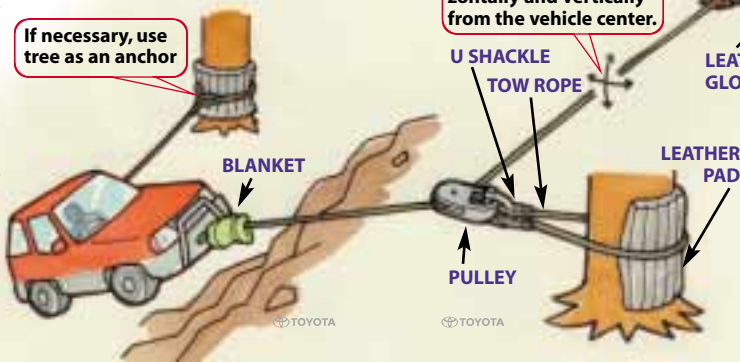
Winching Techniques

Winching your way free

Use a winch not only to get unstuck, but also to remove objects and to climb or descend extremely steep hills. A winch takes the work out of freeing a vehicle. Also a vehicle can free itself with a winch. However, never use the winch to lift or move

people or to lift objects. **Winching requires an anchor:** other vehicles can be used as

If necessary, use tree as an anchor



anchors, but natural objects such as trees, stumps and rocks are best. Select the anchor carefully and ensure it can withstand the load.

Winch operation

1. Depending on the weight of the object to be moved, decide the number of pulleys, length of rope, how to hook the cable (e.g. single/double/triple line) and the direction of pulling.

2. When anchoring the pulling vehicle, engage the parking brake and put blocks in front of the wheels. You may find that pressing on the foot brakes adds further stability.



3. If needed, use an additional anchor for stability or to prevent flipping the vehicle.
4. Wrap the anchor with a leather pad. Also place a blanket in the middle of the cable when winching.

3 Remarks

5. If possible, start the engine of the stuck vehicle and shift to neutral.
6. Keep the wheels pointing

Rewinding

Always inspect and carefully rewind the cable after use. When spooling the cable, be sure to distribute it evenly and tightly on the drum. Replace the cable if any part becomes damaged. For more details regarding winching, please refer to your operation manual.

Inspection before Driving Off-road

Before starting the engine

OUTSIDE THE VEHICLE

Tires (spare included): Check the pressure with a gauge and look carefully for cuts, damage or excessive wear.

Wheel nuts: Make sure nuts are

straight to the pulling direction.

7. Start the engine of the winching vehicle and begin to pull.

Convoys:

When traveling in a convoy, you are responsible for the vehicle behind you, keeping them in view ensures that you know about any problems immediately. Never follow a car too closely. A vehicle stops quickly when it gets stuck, flying rocks can damage your vehicle, in dusty conditions, you may not be able to see clearly, so give the vehicle ahead room.

not missing or loose.

Fluid leaks: After the vehicle has been parked for a while, check underneath for leaking fuel oil, water or fluid. (water dripping from air conditioning after use is normal)

Lights: Make sure the headlamps,

stoplamps, tail lamps, turn signals and other lamps are all working. Check the headlamp aim.



INSIDE THE VEHICLE

Jack and wheel nut wrench: Make sure you have your jack and wheel nut wrench.

Seatbelts: Check that the buckles lock securely. Make sure the belts are not worn or frayed.

Instrument and controls : Especially make sure the service reminder indicators, instrument light and defroster are working.

Brakes: Make sure the pedal has enough clearance.

IN THE ENGINE COMPARTMENT

Spare fuses: Make sure you have

spare fuses. They should cover all the amperage ratings designated on the fuse box lid.

Coolant level: Make sure the coolant level is correct.

Battery and cables: All the battery cells should be filled to the proper level with distilled water. Look for corroded or loose terminals or a cracked case. Check the cables for good condition and connections.

Wiring: Look for damaged, loose or disconnected wires.

Fuel lines: Check the lines for leaks or loose connections.

Entering a vehicle

- 1 Adjust seat position, seatback angle, seat cushion angle, head restraint height and steering wheel angle.
- 2 Adjust inside and outside rear-view mirrors.
- 3 Lock all doors.
- 4 Fasten seatbelts.

Inspection after Driving Off-road

Vehicle condition

The parts related to the engine and powertrain are subject to intense heat and load. Driving through water exposes heated parts to water and causes faster degrada-

tion of parts and material. Mud and sand that sticks to the vehicle can accelerate corrosion. Parts of the vehicle could also have been damaged by rocks or other objects on the road.

Basic maintenance

1 Cleaning: Start with washing the vehicle. Focus on the under body rather than the body with the following in mind:

Mud stuck on the wheel can disturb the wheel balance and result in vibrations at high speed.

Check for scratches on the tires and wheels. The wheel rims and the sidewall of tires have to be inspected carefully because driving through rocky surfaces can damage these parts.

Mud caught by the cover and other

parts that support transmission can result in corrosion.

Sand can easily sneak into arms that support axle and bushing resulting in faster wear on those parts.

Dust stuck on the front of radiator reduces the cooling capacity and can result in corrosion.

2 Easy inspection: Look around tires and under the body for visible damage.

● **Damage to the body:** Damage to the bumper or the body has to be treated immediately if it

interferes with the rotation of tires or power train parts.

● **Damage to power train parts:** Damage to axle housing or rod-arm could cause oil leakage or unstable steering.

Damage to brake fluid hose or brake-wire: Small stones can jump into these parts resulting in oil leakage or damage to the wiring.

● **Tilt:** Put the vehicle on level ground to determine tilt.

Easy Maintenance

After washing and inspection, the following maintenance procedures could be applied.

1. Sand and dust on the air cleaner should be taken off by gently shaking the cleaner. If the dusts persist, consider replacing the cleaner.

2. Check the engine oil. If water has entered, whitening of the oil takes place. If carbon has found its way, blackening of the oil takes place. If the amount is not enough, add oil. If irregularly large amounts of oil is missing, identification and rectification of the cause is called for.

3. The level of brake fluid, power-steering oil and transmission oil, must be verified and inspected if large amounts are missing.

4. Supply sufficient battery liquid.

5. Add grease to all grease-up points.

6. Any damage caused to the drive train should be treated at the garage to the extent necessary.

7. Seriously damaged tires or wheels should be replaced.